

FOAM-FILLED HOLLOW BODY AND METHOD FOR PREVENTING FOAM FROM
DISCHARGING THROUGH AN OPENING OF A HOLLOW BODY TO BE FOAM-

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FILLED

Cross-Reference to Related Application:

This application is a continuation, under 35 U.S.C. § 120, of
copen ding international application No. PCT/EP02/09512, filed
10 August 26, 2002, which designated the United States; this
application also claims the priority, under 35 U.S.C. § 119,
of German patent application No. 101 42 510.4, filed August
30, 2001; the prior applications are herewith incorporated by
reference in their entirety.

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Background of the Invention:

Field of the Invention:

The present invention relates to a foam-filled hollow body, in
particular a refrigerating appliance housing, and a method for
20 preventing the foam from discharging through an opening of a
wall of a hollow body to be foam-filled.

The housings of refrigerating appliances are usually
constructed from an outer wall and an inner wall delimiting a
25 cool room inside the refrigerating appliance, which enclose a
cavity between them, which is filled with thermally insulating

foam during manufacture of the refrigerating appliance. In the process the material, which is to form the foam, is injected in a dense, more or less fluent state into the cavity, and the foaming takes place at least to a large extent by forming of bubbles in the material, if the latter is located in the cavity. At the same time the quantity of material to be used is to be metered out such that the material fills the cavity in the foam-filled state, without leaving cavities free of foam. Inside the cavity the foam is therefore under a certain excess pressure and is inclined to escape through openings in the outer or inner wall. It is important to prevent the foam from escaping, on the one hand because subsequent removal of escaping foam from the surface of the walls of the refrigerating appliance is both time-intensive and cost-intensive, and on the other hand because when foam escapes it can no longer be guaranteed that the injected quantity of material is sufficient to fill out the cavity without actually leaving any gaps.

On the other hand a certain number of openings of the housing is needed in both the outer and the inner wall for e.g. a door hinge, telescopic rails for drawers, etc. disposed in the interior to be mounted thereon.

All these openings must be closed before foaming takes place.

In the case of openings, which are provided for mounting a door hinge, it is known on the other hand to dispose a destructible material layer between the opening and a section of the wall surrounding it on the one hand, and a stiffening part, which has a hole overlapping the opening, which overlaps the opening during foaming of the hollow body, and after foaming to remove the destructible material layer in the region of the opening to attached a fastening element in the opening. Since the destructible material layer cannot in general be welded, a weld connection is made for attaching the stiffening part to the wall at a distance from the destructible material layer.

A problem with this particular method of operation is that the stiffening part and the destructible material layer have to be installed in a very early stage of mounting the housing on the wall, and that, if the destructible layer is off-center as a result of the manual steps between mounting and foaming, it can no longer securely prevent foam from escaping.

This problem can be avoided by the destructible layer being attached in its own work procedure, though this is again associated with increased costs.

Summary of the Invention:

It is accordingly an object of the invention to provide a foam-filled hollow body and a method for preventing foam from discharging through an opening of a hollow body to be foam-filled that overcome the above-mentioned disadvantages of the prior art devices and methods of this general type, which offers effective security against foam from discharging with minimal work effort, as well as a hollow body suitable for carrying out the method.

With the foregoing and other objects in view there is provided, in accordance with the invention, a method for preventing foam from discharging through an opening of a wall of a hollow body to be foam-filled. The method includes applying a destructible material layer between a reinforcing layer having a hole formed therein overlapping the opening and a section of the wall surrounding the opening and the opening of the hollow body. At least one connection is made between the section of the wall and the reinforcing layer without substantial heating of the wall or of the reinforcing layer at a distance from the opening. The distance is smaller than a longest dimension of the destructible material layer. Subsequently the hollow body is filled with foam and the destructible material layer is removed in an area of the opening.

By the connection being made between the wall section and the reinforcing part without substantial heating of the wall and of the reinforcing part, that is, without heating which might
5 damage the destructible layer, the possibility is created of placing the connection so near the opening of the wall that the connection itself can contribute to holding the destructible layer during mounting of the hollow body in place. The distance of the connection from the opening may be
10 no greater than the longest dimension of the destructible layer. The destructible material layer is also attached in the same working procedure, in which the reinforcing part is affixed to the wall. Not that the destructible layer is necessarily prevented from being offset; but it is prevented
15 from being offset so much so that the opening is freed up.

The distance of the connection from the opening is preferably small, and such that the connection extends through the destructible layer. In this way the layer is secured against
20 any offsetting.

The connection is preferably made by driving a connecting body in the vicinity of the destructible layer. Because the connection is made by material deformation, there is no
25 essential heating, and therefore only minor restrictions are featured in the choice of material for the destructible layer.

The destructible layer can be formed of any flat material, which is more easily destroyed than the wall or the reinforcing part itself when the material layer in the vicinity of the opening is removed. Materials are preferably of minimal strength, such as paper, plastic film or metallic foil, in particular aluminum foil, which can be penetrated without need of a special tool, at best with a work piece to be mounted in the opening.

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The connection through material deformation can be e.g. a rivet or clinch connection.

A preferred, if not exclusive, application of the method is foam-filling refrigerating appliance housings, in particular at openings, in which load-bearing components, such as components making up a door hinge, are to be mounted.

With the foregoing and other objects in view there is provided, in accordance with the invention, a foam-filled hollow body. The hollow body contains a wall having an opening formed therein, a reinforcing part having a hole formed therein and disposed with the hole overlapping the opening of the wall, and a destructible layer disposed between the wall and the reinforcing part. The wall and the reinforcing part are connected to each other by a connection

made without substantial heating of the wall and/or of the reinforcing part. The distance of the connection from the opening being small enough that an uncovering of the opening by contact of the destructible layer with the connection is
5 excluded.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

10 Although the invention is illustrated and described herein as embodied in a foam-filled hollow body and a method for preventing foam from discharging through an opening of a hollow body to be foam-filled, it is nevertheless not intended to be limited to the details shown, since various
15 modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention,
20 however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

Brief Description of the Drawings:

Fig. 1 is a perspective view of a refrigerating appliance, to the manufacture whereof the inventive method is applicable;

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Fig. 2 is a sectional view through a leading strip of the refrigerating appliance of Fig. 1 with a hinge mounted thereon;

10 Fig. 3 is an enlarged sectional view of a detail shown in Fig. 2;

Fig. 4 is a sectional view of another detail of a refrigerating appliance housing, where the method according to the invention is applicable; and

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Figs. 5A to 5E are sectional views showing steps of the method according to the invention.

20 Description of the Preferred Embodiments:

Referring now to the figures of the drawing in detail and first, particularly, to Fig. 1 thereof, there is shown a perspective view of a refrigerating appliance with a housing 1, to which the invention can be applied. The housing 1 contains an outer wall, which is made up of several side wall plates 2 and an inner wall 3, which are connected in the

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vicinity of a front side 4 of the housing by way of edge strips 5 connected monobloc to the side wall plates 2, as well as leading strips 6, 7 extending transversely across the front side 4.

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Hinges 8, which bear two doors 9, 10, are in each case screwed onto the leading strips 6, 7.

Fig. 2 shows a horizontal section through a front region of the housing 1 at the level of a hinge 8. A free end of the edge strip 5 is formed into a clamp 11, in which the leading strip 6 is held. The leading strip 6 is made up of an external viewing sheet 12, a reinforcing part 13, in which threaded shanks 14 for taking up non-illustrated screws for fastening the hinge 8 are formed, as well as a layer 15 of a destructible material such as paper, plastic film or metallic foil, which extends between the viewing sheet 12 and the reinforcing part 13, and which closes openings 16, 17 in the viewing sheet 12 or reinforcing part 13 in the state shown in Fig. 2 prior to mounting of the screws provided for this purpose. The structure is more easily viewed in Fig. 3, which shows an end section of the leading strip 6 on an enlarged scale. In two places a truncated (oversized in Fig. 3) connecting body 18 is formed monobloc from the viewing sheet 12 of the leading strip 6 and is driven with a piece 19 of the destructible layer 15 into the material of the reinforcing

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part 13. Because the connecting body 18 has a conically widened head, it holds the bond of the viewing sheet 12, the destructive layer 15 and the reinforcing part 13 firmly together. The manufacture of the connecting body 18 is
5 detailed further with respect to Figs. 5A-5E.

In a horizontal section Fig. 4 shows the front section of a side wall plate 2 with the edge strips 5 and the clamp 11 in a modified configuration. Here, in a comparison to the
10 configuration of Fig. 2 the edge strip 5 widens, so that the clamp 11 no longer touches the side wall plate 2, but is separated from the latter by a cavity, in which a reinforcing part 20 with a formed threaded shank 14 is disposed, which is provided to take up a screw for anchoring a door hinge. On
15 both sides of an opening 21 of the edge strip 5 provided for the screw connecting bodies 18 are driven into the reinforcing part 20, as in Fig. 3.

Figs. 5A to 5E illustrate the production of the connecting
20 body.

Fig. 5A shows a section of a metallic wall 25, which might be e.g. the leading strip 6 of Fig. 3 or the edge strips 5 of Fig. 4, with a built-in opening 26. A reinforcing part 27,
25 likewise with an opening 28, for reinforcing the wall 25, is

attached thereto. Between both is the layer 15 of a destructible material.

These three parts are, as shown in Fig. 5B, brought into contact with one another, and a die 29 and a matrix 30 are positioned opposite one another on the wall 25 and the reinforcing part 27. The die 29 bears a truncated mandrel 31, the matrix 30 has a complementary recess 32 of substantially cylindrical form with an annular depression 33 formed on the outer edge of its floor. When the die and matrix are brought together the material of the wall 25 and of the reinforcing part 27 is distorted, whereby material of the reinforcing part 27 first comes into contact with the central region of the floor of the recess 32. As the die and matrix are closed further the material at the tip of the mandrel 31 is driven out in a radial direction to fill out the annular depression 33, by which, as shown in Fig. 5C, the above-mentioned connecting body 18 is formed from the material of the wall 25 inside the reinforcing body 27 with a head widening towards the matrix 30, creating a detachable connection between the wall 25 and the reinforcing part 27. Since the connecting body 18 is elongated by the destructible layer 15, the latter is secured against being offset.

This connection method is also described as clinching.

In Fig. 5C in each case only a single clinch connection is illustrated, but it is understood that in the vicinity of the opening 26 as many clinch connections as necessary can be formed to fasten the reinforcing part 27 adequately to the

5 wall 25.

Other options of connecting the wall 25 and the reinforcing part 27 to one another at the same time as attaching the layer 15 are to use rivets or screws as the connecting body.

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After the wall 25, the reinforcing part 27 and the layer 15 are joined they are combined with other components into a hollow body, such as in particular the housing of a

refrigerating appliance. During subsequent foam filling of

15 the hollow body the layer 15 blocks the opening 26, so that, as Fig. 5D shows, the foam 34 cannot penetrate through the opening 26.

As soon as the foam 34 has adequately bonded, so that it no

20 longer occurs when the layer 15 is destroyed, the layer 15 can be penetrated in the vicinity of the opening 26 with a

fastening element provided for mounting in the opening 26,

such as a screw 35 shown in Fig. 5E, in order to e.g. screw a part 36 of a door hinge onto the wall 25.

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In the examples described here it has always assumed that the connecting body 18 was driven from the outside of the hollow body into a reinforcing part located in the interior. The advantage is that there are no projections on the outside of
5 the hollow body, which might hinder attachment of a work piece to the surface. Of course, the connecting body can also be driven from the inside. A projection possibly on the outside can then act as locking for a work piece to be attached on the outside.